

## CLAIMS:

1. A Coriolis flowmeter capable of use as a vibrating densitometer in multiphase flow environments including combinations of gas and liquids, gas and solids, or solids and liquids, said flowmeter comprising:

at least one flowtube;

means for vibrating said flowtube at a fundamental frequency corresponding to a density of material flowing through said flowtube;

means for monitoring drive gain in vibrating said flowtube for a change in value to determine the existence of multiphase flow through said flowtube; and

means for responding to said monitoring means when said monitoring means determines the existence of multiphase flow in said flowtube.

2. The flowmeter as set forth in claim 1 wherein said monitoring means includes means for comparing said drive gain to a threshold value to determine if said drive gain exceeds said threshold value as an indicator of multiphase flow.

3. The flowmeter as set forth in claim 2 wherein said threshold value is indicative of multiphase flow including gas and liquids.

4. The flowmeter as set forth in claim 3 wherein said monitoring means includes means for comparing said drive gain to a second threshold value to determine if said drive gain exceeds said second threshold value as an indicator of multiphase flow including liquid and solid matter.

5. The flowmeter as set forth in claim 1 wherein said responding means includes means for providing a density value other than a density value corresponding to said fundamental frequency.

6. The flowmeter as set forth in claim 5 wherein said providing means includes means for retrieving data representative of historical density measurements from said flowtube for use as said other density value.

7. The flowmeter as set forth in claim 6 wherein said historical density measurements are averaged over an interval of time to provide an average density value.

8. The flowmeter as set forth in claim 7 wherein said historical density measurements are subjected to statistical analysis to eliminate or reduce spurious measurements from being included in said average density value.

5 9. The flowmeter as set forth in claim 5 wherein said providing means includes means for retrieving data representative of density measurements obtained from laboratory measurements for use as said other density value.

10 10. The flowmeter as set forth in claim 5 wherein said providing means includes means for retrieving data representative of density measurements obtained from a correlation for use as said other density value.

11. The flowmeter as set forth in claim 1 wherein said flowmeter is operably coupled with a producing well for the conduct of measurements upon fluid flowing from said well, and said responding means includes means for stopping a well test in progress upon production flowing from said well.

12. The flowmeter as set forth in claim 1 wherein said flowmeter is operably coupled with a producing well for the conduct of measurements upon fluid flowing from said well, and said responding means includes means for indicating an alarm indicative of said multiphase flow.

13. The flowmeter as set forth in claim 1 wherein said responding means includes means for providing drive gain as a meter output.

20 14. A method of operating a Coriolis flowmeter as a vibrating tube densitometer, said method comprising the steps of:

vibrating at least one flowtube of a Coriolis flowmeter at a fundamental frequency corresponding to a density of material flowing through said flowtube;

25 monitoring drive gain in vibrating said flowtube for a change in value to determine the existence of multiphase flow through said flowtube; and

responding to said monitoring means when said monitoring means determines the existence of multiphase flow in said flowtube.

30 15. The method as set forth in claim 14 wherein said step of monitoring drive gain includes comparing said drive gain to a threshold value to determine if said drive gain exceeds said threshold value as an indicator of multiphase flow.

16. The method as set forth in claim 15 wherein said step of comparing includes setting said threshold value as an indicator of multiphase flow including gas and liquids.

17. The method as set forth in claim 16 wherein said step of comparing includes comparing said drive gain to a second threshold value to determine if said drive gain exceeds said second threshold value as an indicator of multiphase flow including liquid and solid matter.

18. The method as set forth in claim 14 wherein said step of responding includes providing a density value other than a density value corresponding to said fundamental frequency.

19. The method as set forth in claim 18 wherein said step of providing includes a step of retrieving data representative of historical density measurements from said flowtube for use as said other density value.

20. The method as set forth in claim 19 including a step of averaging said historical density measurements are averaged over an interval of time to provide an average density value.

21. The method as set forth in claim 20 including a step of subjecting said historical density measurements to statistical analysis to eliminate or reduce spurious measurements from being included in said average density value.

22. The method as set forth in claim 18 wherein said providing means includes means for retrieving data representative of density measurements obtained from laboratory measurements for use as said other density value.

23. The flowmeter as set forth in claim 18 wherein said providing means includes means for retrieving data representative of density measurements obtained from a correlation for use as said other density value.

24. A product comprising:  
instructions operational when executed by a processor to direct the processor to  
receive drive gain inputs from a Coriolis meter and process the drive gain inputs,

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process the drive gain inputs to determine the existence of multiphase flow through said Coriolis flowmeter by comparing said drive gain inputs against a threshold value indicative of multiphase flow, and

providing outputs including a historical density value not representative of actual density measurements for the duration of said multiphase flow; and a storage medium operational to store said instructions.